

RESEARCH ARTICLE

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# Armada nilotica A. Bang-Haas (Lep., Noctuidae, Acontiinae) new record with first description of male from Iran

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## Abstract

*Armada nilotica* A. Bang-Haas, male specimen is described for the first time and illustration of adult's genitalia are presented. This species is also recorded as new record for the fauna of Iran and diagnosis and description of the newly recorded species are given. Bionomics and distribution of Iranian *Armada* species are presented and an identification key is provided. The tribe Armadini comprises nine genera worldwide, all found in the arid and semiarid zones. The genus *Armada* is represented in Iran by seven species: *A. heliothidia* (Hampson, 1896), *A. dentata* (Staudinger, 1884), *A. nilotica* A. Bang-Haas, 1912, *A. fletcheri* Wiltshire, 1961, *A. maritima* Brandt, 1939, *A. panaceorum* (Ménétries, 1848) and *A. clio* (Staudinger, 1884). Of these, *A. Panaceorum* and *A. clio* have wider distribution rang in Iran (the former is widespread throughout Iran) while the remaining species are restricted, in the range, to the arid regions of the south and southeast.

**Key words:** Acontiinae, *Armada*, moth, new record, taxonomy.

## INTRODUCTION

The tribe Armadini comprises nine genera worldwide, all found in the arid and semiarid zones (Goater et al., 2003). The systematic position of Armadini has frequently been changed over time. This genus has traditionally been classified in Catocalinae for its quadrified hindwing venation. In order to making the Catocalinae as a monophyletic group, Fibiger and Lafontaine (2005) transferred Armadini to the Acontiinae for the presence of the saccular crest and the paired setose patches on the scaphium. The monomonyly of the tribe Armadini is held by the scaphium that has subbasally two laterally setose crests (Goater et al., 2003). In an attempt to stabilize the Noctuidae higher classification, using protein-coding genes, Keegan et al. (2021) inferred a phylogeny and retained the Armadini, based on their achieved results, within Acontiinae.

Having studied the shared character states (almost similar fore-hindwing pattern, palpi and compound eyes shapes, etc.) of *Armada clio* (Staudinger, 1884), *Armada dentata* (Staudinger, 1884), *Armada panaceorum* (Ménétries, 1848) and *Tarachepha hueberi* (Ershov, 1874), Staudinger (1884) established the genus *Armada* according to *Acontia dentata* as the type species. Wiltshire (1961) treated a group of genera (i.e. *Armada*, *Asplenia* Hampson, 1916, *Riadzia* Wiltshire, 1961, *Metoponrhis*



Staudinger, 1888, *Acrobyla* Rebel, 1903 and *Epharmottomena* John, 1909) based on the characteristics of the male genitalia in the tribe Armadini in Ophiderinae. The old world tribe Armadini was then revised by Wiltshire (1979) and he classified the present taxa into *Metoponrhis* and *Armada* genus-groups. Poole (1989) listed *Armada* in Ophiderinae/Catocalinae too, while Speidel et al. (1996) resurrected Eustrotiinae and provisionally placed *Armada* within. Kitching and Rawlins (1998) and Goater et al. (2003) then classified this genus in Catocalinae.

The imagines of the genus *Armada* are characterised by their small-medium body size, well developed haustellum, frons with strong chitinous projection and lamellate male antennae. It is defined, in the male genitalia, by two autapomorphics; first, the scaphium sub-basally with two lateral, setose crest/hills and the second, costally heavily sclerotized valvae bearing small processes (Goater et al., 2003). The genus *Armada* with its nine species (Wiltshire, 1979, Goater et al., 2003) inhabits arid and semi-arid zones of the Middle East and Central Asia. Up to present time, six species of the genus *Armada* have been reported from Iran (Brandt, 1939, Wiltshire, 1961, Wiltshire, 1979). This paper describes the male *Armada nilotica* A. Bang-Haas for the first time. An identification key for the *Armada* species in Iran is provided and bionomics and distribution of the *Armada* species are presented.

## MATERIAL AND METHODS

Moth specimens of *A. nilotica* examined in this study were collected using portable light traps (powered by 12-V batteries and 8-W black light UVB tubes) in Kerman province, south of Iran. The data of other species of the genus *Armada* were obtained from the published literatures or from the specimens deposited in the Collection of Noctuidae, Shahid Bahonar University of Kerman (Kerman, Iran). The genitalia slides of the examined material were prepared using routine method described by Fibiger (1990) with little modifications. Goater et al. (2003) was followed for the terminology used and the systematic order of the taxa. The Photographs of the adult specimens were taken with a Canon digital camera (model: Power Shot A710) and those of the genitalia by an Olympus SZH stereo-microscope with an Omax (18Mp) A35180U3 digital camera.

## RESULTS

### List of Iranian species

#### Genus *Armada* Staudinger, 1884

- A. heliothidia* (Hampson, 1896)
- syn. *A. roseifemur* Brandt, 1939
- A. dentata* (Staudinger, 1884)
- syn. *A. afghana* Hampson, 1926
- A. nilotica* A. Bang-Haas, 1912
- A. fletcheri* Wiltshire, 1961
- A. maritima* Brandt, 1939
- A. panaceorum* (Ménétries, 1848)
- syn. *A. distincta* Rothschild, 1915
- A. clio* (Staudinger, 1884)

#### Key to Iranian species of *Armada* Staudinger based on the male genitalia (Goater et al., 2003, Wiltshire, 1979)

1. Costa of valvae without process.....*A. heliothidia*
- Costa of valvae with a process.....
  - .....2
  2. Cucullus weak, costal process small, bare, almost tapered.....3
  - Cucullus developed, costal process large and wide, hairy.....5

3. Vesica without cornutus, left clasper small.....	<i>A. fletcheri</i>
- Vesica with two cornuti, left clasper large and thick.....	<i>A. fletcheri</i>
.....4	
4. Costal process tapered, aedeagus with a small cornutus proximally.....	<i>A. dentata</i>
- Costal process broader than long, aedeagus without cornutus.....	<i>A. nilotica</i>
5. Vesica without cornutus .....	<i>A. panaceorum</i>
- Cornutus present on vesica.....	<i>A. panaceorum</i>
.....6	
6. Vesica with three cornuti .....	<i>A. maritima</i>
- Vesica with a single cornutus .....	<i>A. clio</i>

#### **Genus *Armada* Staudinger, 1884**

*Armada* Staudinger, 1884, Romanoff Mémoires sur les Lépidoptères 1: 142. Type species: *Acontia dentata* Staudinger, 1884.

#### ***Armada heliothidia* (Hampson, 1896)**

*Melipotis heliothidia* Hampson, 1896, Fauna of British India 4: 532. L. t.: India.

syn. *roseifemur* Brandt, 1939

**Bionomics:** univoltine autumnal species, *A. heliothidia* inhabits the most south-eastern deserts of Iran and the tropical eremic zones of India. The larva was described by Beck (2013), no report on its food plants is available.

**General distribution:** India, Iran (Wiltshire, 1979).

**Distribution in Iran:** Sistan-va-Balouchestan and Tehran (Ebert and Hacker, 2002, Brandt, 1939).

#### ***Armada dentata* (Staudinger, 1884)**

*Acontia dentata* Staudinger, 1884, Romanoff Mémoires sur les Lépidoptères 1: 142. L. t.: Akhal Tekke.

syn. *afghana* Hampson, 1926

**Bionomics:** univoltine spring flying species, *A. dentata* inhabits semi-desert stony zones of central-south Iran to Afghanistan and Transcaspia. The larval stages and their food plants are unknown as yet.

**General distribution:** Afghanistan, Turkmenistan, Kazakhstan and Iran (Wiltshire, 1979, Poltavsky et al., 1998, Shovkoon and Trofimova, 2016).

**Distribution in Iran:** Kerman, Sistan-va-Balouchestan and Khorasan (Wiltshire, 1979, Rabieh, 2018).

#### ***Armada nilotica* A. Bang-Haas, 1912**

*Armada dentata* v. *nilotica* Bang-Haas, 1912, Deutsche Entomologische Zeitschrift Iris, 26: 160. L. t.: Cairo.

**Material examined:** 2 ♂♂, Iran, Prov. Kerman, Kerman city, Haftbagh, 1800m, 30°09'50"N 57°09'06"E, 18.04.2011, leg. H. Ramezani., Slide No. ASH558m. 1 ♀ IRAN, Prov. Kerman, Bardsir, Bidouyeh Protected Area, 1805 m, 30°06'32.2"N 56°55'28.8"E, 26.04.2017, leg. M. Ghaemmaghamian, Slide No. MGH223f.

**Diagnosis:** *A. nilotica* taxonomically stands between *A. dentata* and *A. fletcheri*, the diagnostic characteristics of adults are given under *A. fletcheri* described by Wiltshire (1961), due to the first description of the male genitalia, the genital characteristics are presented here: compared to both species, valvae of *A. nilotica* are almost paralleled, clasper is longer and stronger, costal process is wider than long and aedeagus bears no sclerotized process distally. Compared to *A. nilotica*, the vesica of *A. fletcheri* lacks any cornutus; the costal process of *A. dentata* is tapered and its aedeagus bears a small thorn-like process.

*Description:* male (fig. 1A), wingspan 25-28 mm. head, collar, tegulae, thorax and forewing ground colour beige light brown. Antennae filiform, simple, palpi relatively short, the third segment the shortest, compound eyes large, globular. Forewing triangular, basal streak missing, basal line obsolescent, ante-medial line conspicuous, noctuid maculation complete, orbicular and reniform stigmata whitish, outlined by fine beige scales, claviform stigma filled by dark brown, median shade dark brown, post-medial line thinner at costal margin, sub marginal line as blackish wedges, termen fine, fringes white-brown alternately. Hindwing oval, basal two-third white, black discal spot present, longer than wide, marginal band broad, dark-brown, with whitish spot at posterior one third, fringes whitish with brown scales. Underside of forewing grayish white, discal spot present, black, marginal area brownish, underside of hindwing white, discal spot black, ovate, marginal area grayish brown, tornal spot conspicuous. Female (fig. 1B) as male.

*Male genitalia:* (fig. 2A,B), uncus long, slender, curved, tapering, distal tufts of scaphium present, tegument low; valvae asymmetrical, sclerotized, costa slightly convex, costal process present on the costal extremity, button-like, sacculus oval-rectangular, sacular extension narrower on right side, both reaching base of cucullus, clasper asymmetrical, thumb-like and thick on the left valva, very short on the right, cucullus and corona weak, juxta longer than wide, pentagonal, wider basally, vinculum V-shaped, saccus large. Aedeagus long, slightly curved, wider distally, vesica short, wide, bent dorsally, two heavily sclerotized thorn-like cornuti present.

*Female genitalia:* papillae anales weak (fig. 2C), rounded, setose, apophyses slender, posterior one longer, ostium bursae sclerotized, more or less funnel-shaped, ductus bursae short, broad, corpus bursae globular, membranous, appendix bursae elongate.

*Bionomics:* presumably multivoltine species (Wiltshire, 1979). *A. nilotica* inhabits stony and sandy semi-desert up to 1800 m. altitude vegetated by shrubs and semi-shrubs. It flies, in Iran, from April to May, the larvae have been described by Andres and Seitz (1924), Wiltshire (1948) and Wiltshire (1979) and feed on *Heliotropium luteum* (Wiltshire (1979) and *H. arabense* (Andres and Seitz, 1924).

*General distribution:* Egypt (Wiltshire, 1979) and Iran.

*Distribution in Iran:* Kerman (new record from Iran).



FIGURE 1. *Armada nilotica* adults. A. male, Iran, Kerman prov.; B. female, Iran, Kerman prov.

#### *Armada fletcheri* Wiltshire, 1961

*Armada fletcheri* Wiltshire, 1961, Journal of the Bombay Natural History Society 58: 626. L. t.: Khuzestan.

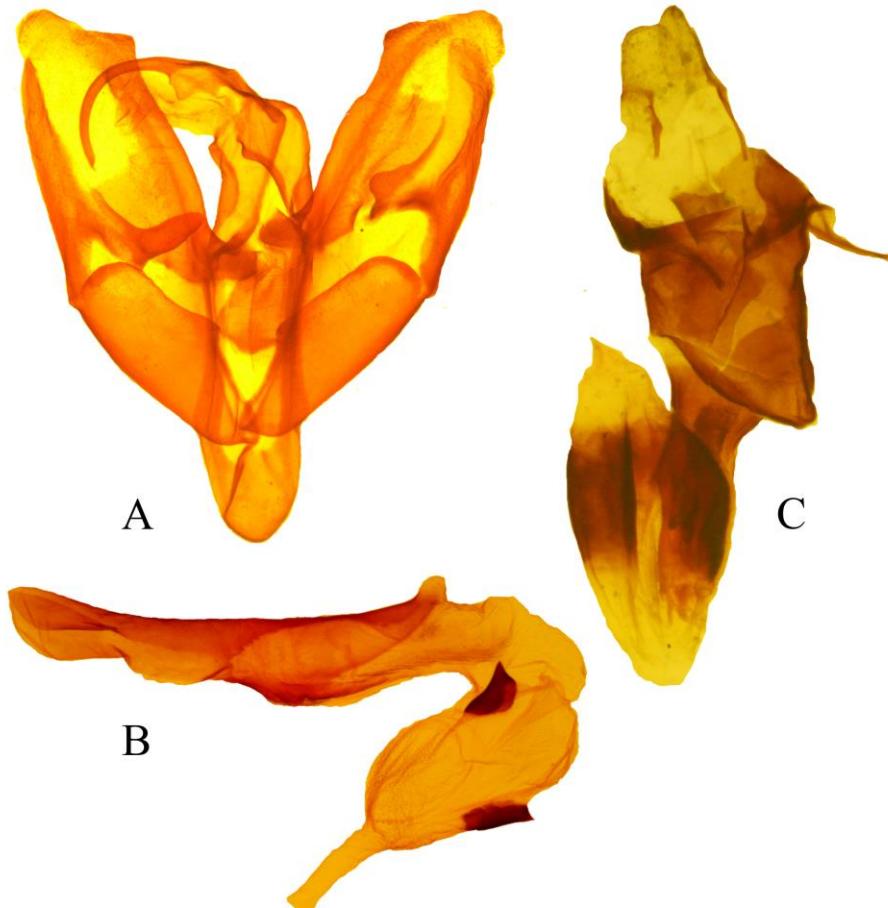
*Bionomics:* multivoltine species, *A. fletcheri* inhabits desert of Ahwaz city SW Iran and eremic hot deserts of Saudi Arabia. The larvae have not been described and their food plants are still unknown.

*General distribution:* Saudi Arabia and Iran (Wiltshire, 1979).

*Distribution in Iran:* Khuzestan (Wiltshire, 1961).

***Armada maritima* Brandt, 1939**

*Armada maritima* Brandt, 1939, Entomologische Rundschau 56: 294. L. t.: Iran, Sistan va Balouchestan.  
*Bionomics:* multivoltine deserticolous species, *A. maritima* inhabits arid desert of the most south-eastern zone of Iran, Chabahar. The biology, habitat, larval morphology and its food plants are unknown. Kravchenko et al. (2007) collected this species from a stony arid desert with sparse vegetation of semi-shrubs and some *Tamarix* bushes.



**FIGURE 2.** *Armada nilotica* genitalia. A. male armature; B. male aedeagus and vesica; C. female genitalia.

*General distribution:* Iran, Saudi Arabia, Oman, United Arab Emirates, Levant (Brandt, 1939, Wiltshire, 1961, Wiltshire, 1979, Kravchenko et al., 2007).

*Distribution in Iran:* Sistan va Balouchestan (Brandt, 1939) and Hormozgan (Ebert and Hacker, 2002).

***Armada panaceorum* (Ménétries, 1848)**

*Ophiusa panaceorum* Ménétries, 1848, Mémoires de l'Académie Impériale des sciences de St. Pétersbourg 6: 292. pl. 6, fig. 6. L. t.: Bokhara.

syn. *distincta* Rothschild, 1915

*Material examined:* 8♂♂, 2♀♀, Iran, Sistan & Balouchestan, Bazman, 10.03.2008. leg. E. Kazemi. 1♀, Iran, Prov. Hormozgan, 10 km NE of Bandar Abbas, 200 m, 13. 03. 2007, leg. Asghar Shirvani.

*Bionomics:* univoltine desert and semi-desert species, *A. panaceorum* flies, depend on the inhabited geographical region, from February to June. The reported larval foodplants are *Arnebia decumbens*,

*Heterocaryum rigidum* and *Lappula ceratophora* (Kravchenko et al., 2007). The early stages are unknown and have not been described.

**General distribution:** Eurasian, a pan-eremic species distributed from North Africa, Canary Islands, Near and Middle East, Kazakhstan, Afghanistan, Tajikistan, Turkmenistan, Uzbekistan, South Russia, Mongolia and Tibet (Wiltshire, 1979, Poltavsky et al., 1998, Goater et al., 2003, Kravchenko et al., 2007, Ivinskis and Miatleuski, 1999, Shovkoon and Trofimova, 2016).

**Distribution in Iran:** Hormozgan, Tehran, Sistan-and-Baluchestan, Azarbayjan-e-Gharbi, Azarbayjan-e-Sharghi, Khorasan (Ebert and Hacker, 2002, Rabieh, 2018) and Kerman (first record).

#### ***Armada clio* (Staudinger, 1884)**

*Acontia clio* Staudinger, 1884, In Romanoff Mem. Lep. 1: 145. L. t.: Akhal Tekke.

**Bionomics:** univoltine early spring flying species. The larvae have not been described and their life history is still unknown.

**General distribution:** Iran, Uzbekistan, Turkmenistan, Kazakhstan and Tajikistan (Matov et al., 2021, Shovkoon and Trofimova, 2016, Ebert and Hacker, 2002).

**Distribution in Iran:** Qom (Ebert and Hacker, 2002), Mazandaran and Guilan (Matov et al., 2021).

#### **DISCUSSION**

All members of the genus *Armada* are reported from the desert regions of North Africa, Europe, Middle East and Central Asia. Of the *Armada* species, *A. panaceorum*, a pan-eremic species with the widest range of distribution, is extended from the North Africa to Mongolia and Tibet (Goater et al., 2003). This genus is presented in Europe by *A. clio* (Ciscaucasia) and *A. panaceorum* (S Russia). As the arid regions are preferred habitat for this genus, seven species out of nine are now inhabiting Iran territory. Of the Iranian *Armada*, *A. panaceorum* and *A. clio* have wider distribution rang in Iran (the former is widespread throughout Iran) while the remaining species are restricted, in the range, to the arid regions of the south and southeast (Kerman, Sistan-and-Baluchestan, Hormozgan and Khuzestan provinces). Adults of *A. panaceorum*, *A. clio*, *A. dentata* and *A. heliothidia* are flying in a single generation while those of *A. maritima*, *A. nilotica* and *A. fletcheri* appears in the more generations. Our knowledge on the larval food plant of the genus *Armada* is poor and limited to those reported for host plants of *A. panaceorum*. Similarly, the immature stages of most *Armada* species are undescribed except those of *A. nilotica* and *A. heliothidia*. Since Wiltshire (1979) revised the tribe Armadini, there is no extensive and more complete taxonomic study presenting autapomorphies for the true genera of this taxon.

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#### **LITERATURE CITED**

- Andres, A. & Seitz, A. 1924. Die lepidopteren-fauna Agyptens pt. 3. *Senkenbergiana*, 6, 13-83.
- Beck, H. 2013. News of the Armadini by the knowledge of the larva of *Armada heliothidia* (Hampson, 1896). XVIII European Congress of Lepidopterology, Bulgaria. 22-23.
- Brandt, W. 1939. Beitrag zur Lepidopteren-Fauna von Iran. Einige neue Agrotiden aus Luristan und Beloutschistan. *Entomologische Rundschau*, 56, 294-299.
- Ebert, G. & Hacker, H. H. 2002. Beitrag zur Fauna der Noctuidae des Iran: Verzeichnis der bestande im staatlichen Museum für Naturkunde Karlsruhe, taxonomische Bemerkungen und beschreibung neuer taxa. *Esperiana*, 9, 237-409.

Fibiger, M. 1990. *Noctuinae I. Noctuidae Europaea*, Volume 1, Entomological Press, Sorø, Denmark.

Fibiger, M. & Lafontaine, J. D. 2005. A review of the higher classification of the Noctuoidea (Lepidoptera) with special reference to the Holarctic fauna. *Esperiana*, 11, 7-92.

Goater, B., Ronkay, L. & Fibiger, M. 2003. *Catocalinae & Plusiinae. Noctuidae Europaea 10*, Entomological Press, Sorø.

Ivinskis, P. & Miatleuski, J. 1999. Data on noctuidae (lepidoptera) of turkmenistan. *Acta Zoologica Lituanica*, 9, 201-208.

Keegan, K. L., Rota, J., Zahiri, R., Zilli, A., Wahlberg, N., Schmidt, B. C., Lafontaine, J. D., Goldstein, P. Z. & Wagner, D. L. 2021. Toward a stable global Noctuidae (Lepidoptera) taxonomy. *Insect Systematics and Diversity*, 5, 1-24.

Kitching, I. J. & Rawlins, J. E. 1998. The Noctuoidea. In: KRISTENSEN, N. P. (ed.) *Arthropoda: Insecta. Lepidoptera, Moths and Butterflies: evolution, systematic and biogeography*, Edited by Fischer, M. (Ed.). *Handbuch der Zoologie/Handbook of Zoology*. Berlin, Walter de Gruyter Band.

Kravchenko, V. D., Fibiger, M., Hausmann, A. & Muller, G. C. 2007. Noctuidae, vol. 2. In: MULLER, G. C., KRAVCHENKO, V. D., HAUSMANN, A., SPEIDEL, W., MOOSER, J. & WITT, T. J. (eds.) *The Lepidoptera of Israel*. Sofia-Moscow: Pensoft Publishers.

Matov, A. Y., Poltavsky, A. N. & Korzhov, P. N. 2021. Revision of the taxonomic rank of *Armada barrygoateri* Fibiger et Ronkay, 2003 (Lepidoptera: Noctuidae: Acontiinae). *Caucasian Entomological Bulletin*, 17 345–349.

Poltavsky, A. N., Nekrasov, A. V., Petchen, V. I. & Hatchikov, E. A. 1998. The Noctuidae fauna of Turkmenistan (Lepidoptera). *Phegea*, 26, 103-116.

Poole, R. W. 1989. Noctuidae, vols 1-3. In: Heppner, J. B. (ed.) *Lepidopterorum Catalogus (New Series)*. Fasc. 118. Brill. Lieden, New Yourk, Kobenhavn, Köln.

Rabieh, M. M. 2018. Checklist of the family Noctuidae in great Khorasan province, North-east Iran. *Entomofauna*, 39/2, 681-695.

Shovkoon, D. F. & Trofimova, T. A. 2016. To research of Noctuoidea fauna (Lepidoptera) of the Western Kazakhstan. *Entomofauna*, 37, 597-616s.

Speidel, W., Fänger, H. & Naumann, C. M. 1996. The phylogeny of the Noctuidae (Lepidoptera). *Systematic Entomology*, 21, 219-251.

Staudinger, O. 1884. Beitrag zur kenntniss der lepidopteren-fauna das Achal-Tekke-Gebiets. *Mémoirs sur les lépidoptères. Red. N.M. Romanoff*, 1, 139–154.

Wiltshire, E. P. 1948. The Lepidoptera of the kingdom of Egypt, part 1. *Bulletin of the Society Fouad Ier Entomology*, 32, 203-294.

Wiltshire, E. P. 1961. A new genus, eight new species, seven forms, and notes on the Lepidoptera of Saudi Arabia, Bahrain, and Iran. *Journal of the Bombay Natural History Society* 58, 608-631.

Wiltshire, E. P. 1979. A revision of the Armadini (Lep., Noctuidae). *Entomonograph*, 2, 1-79.